

**In the claims:**

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1. (Original) A system that detects a wiring fault for use within a process control system having a plurality of smart field devices communicatively coupled to a protocol bus, the system comprising:

a wiring fault detection unit that is adapted to be coupled to the protocol bus to measure an electrical characteristic associated with the protocol bus; and

a wiring fault diagnostic manager communicatively coupled to the wiring fault detection unit that uses the measured electrical characteristic to determine a type of the wiring fault.

2. (Original) The system of claim 1, further including a linking device that enables a controller to communicate with the plurality of smart field devices, and wherein the wiring fault detection unit resides within the linking device.

3. (Original) The system of claim 2, wherein the wiring fault diagnostic manager resides within the linking device.

4. (Original) The system of claim 1, wherein the wiring fault detection unit and the wiring fault diagnostic manager reside within a portable unit that is adapted to be locally coupled to the protocol bus.

5. (Original) The system of claim 4, wherein the portable unit includes:  
a memory;  
a processor communicatively coupled to the memory;  
a display communicatively coupled to the processor that is adapted to display wiring fault information;  
a keypad communicatively coupled to the processor; and  
a power source that supplies power to the portable unit.

6. (Original) The system of claim 1, wherein the wiring fault detection unit includes a signal switching unit and a plurality of measurement blocks coupled to the signal switching unit.

7. (Original) The system of claim 6, wherein the signal switching unit is adapted to be coupled to the protocol bus and to couple a signal line of the protocol bus to one of the plurality of measurement blocks.

8. (Original) The system of claim 7, wherein the signal switching unit is further adapted to disconnect the signal line of the protocol bus from a communication circuit.

9. (Original) The system of claim 6, wherein the signal switching unit is responsive to signals sent by the wiring fault diagnostic manager.

10. (Original) The system of claim 6, wherein the plurality of measurement blocks includes one of an ohmmeter block, a voltmeter block, a signal generator block, a noise meter block, a ground fault detector block, and a capacitance meter block.

11. (Original) The system of claim 1, wherein the type of the wiring fault is one of a short circuit, an open circuit, a ground fault, an improper termination, an insufficient signal strength, a poor quality ground connection and an improper supply voltage.

12. (Original) A method of detecting a wiring fault for use within a process control system having a user interface, a protocol bus, a wiring fault detection unit including a plurality of measurement blocks and a signal switching unit, and a wiring fault diagnostic manager, the method comprising the steps of:

connecting a signal line of the protocol bus to one of the plurality of measurement blocks;

measuring an electrical characteristic associated with the protocol bus using the one of the plurality of measurement blocks;

sending the measured electrical characteristic to the wiring fault diagnostic manager;  
determining a type of the wiring fault based on the measured electrical characteristic;  
and

automatically reporting the type of the wiring fault to the user interface.

13. (Original) The method of claim 12, wherein the step of connecting the signal line of the protocol bus to the one of the plurality of measurement blocks includes the step of connecting the signal line to one of an ohmmeter block, a voltmeter block, a signal generator block, a noise meter block, a ground fault detector block, and a capacitance meter block.

14. (Original) The method of claim 12, wherein the step of connecting the signal line of the protocol bus to the one of the plurality of measurement blocks includes the step of connecting the signal line to the one of the plurality of measurement blocks in response to a signal from the wiring fault diagnostic manager.

15. (Original) The method of claim 12, wherein the step of measuring the electrical characteristic associated with the protocol bus using the one of the plurality of measurement blocks includes the step of disconnecting the signal line of the protocol bus from a communication circuit.

16. (Original) The method of claim 12, wherein the step of measuring the electrical characteristic associated with the protocol bus includes the step of measuring one of a resistance, a capacitance, a signal amplitude, a noise level and a power supply voltage.

17. (Original) The method of claim 12, wherein the step of determining the type of the wiring fault based on the measured electrical characteristic includes the step of comparing the measured electrical characteristic to a predetermined value associated with the wiring fault.

18. (Original) The method of claim 17, wherein the step of comparing the measured electrical characteristic to the predetermined value includes the step of using a predetermined value associated with one of a short circuit, an open circuit, a ground fault, an improper termination, an insufficient signal strength, a poor quality ground connection and an improper supply voltage.

19. (Original) The method of claim 12, wherein the step of automatically reporting the type of the wiring fault to the user interface includes the step of sending wiring fault information to the user interface via a controller.

20. (Original) A system for detecting a wiring fault for use within a process control system having a user interface, a controller, a protocol bus, a processor, a wiring fault detection unit including a plurality of measurement blocks and a signal switching unit, the system comprising:

a computer readable medium;

a first routine stored on the computer readable medium and adapted to be executed by the processor that causes the wiring fault detection unit to connect a signal line of the protocol bus to one of the plurality of measurement blocks;

a second routine stored on the computer readable medium and adapted to be executed by the processor that causes the wiring fault detection unit to measure an electrical characteristic associated with the protocol bus using the one of the plurality of measurement blocks;

a third routine stored on the computer readable medium and adapted to be executed by the processor that determines a type of the wiring fault based on the measured electrical characteristic; and

a fourth routine stored on the computer readable medium and adapted to be executed by the processor that automatically reports the type of the wiring fault to the user interface.

21. (Original) The system of claim 20, wherein the second routine is further adapted to cause the wiring fault detection unit to disconnect the signal line of the protocol bus from a communication circuit.

22. (Original) The system of claim 20, wherein the second routine is further adapted to measure one of a resistance, a capacitance, a signal amplitude, a noise level and a power supply voltage.

23. (Original) The system of claim 20, wherein the third routine is further adapted to compare the measured electrical characteristic to a predetermined value associated with the wiring fault.

24. (Original) The system of claim 23, wherein the third routine is further adapted to use a predetermined value associated with one of a short circuit, an open circuit, a ground fault, an improper termination, an insufficient signal strength, a poor quality ground connection and an improper supply voltage.

25. (Original) A system that detects a wiring fault for use within a process control system having a controller and a protocol bus, the system comprising:

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a plurality of measurement blocks communicatively coupled to the controller and adapted to be coupled to the protocol bus, wherein the controller is programmed to connect one of the plurality of measurement blocks to the protocol bus to detect the wiring fault.

26. (Original) The system of claim 25, wherein the plurality of measurement blocks includes one of an ohmmeter block, a voltmeter block, a signal generator block, a noise meter block, a ground fault detector block, and a capacitance meter block.

27. (Original) The system of claim 25, wherein the plurality of measurement blocks resides within a linking device.

28. (Original) The system of claim 25, wherein the wiring fault is one of a short circuit, an open circuit, a ground fault, an improper termination, an insufficient signal strength, a poor quality ground connection and an improper supply voltage.

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